



MASENO UNIVERSITY
UNIVERSITY EXAMINATIONS 2013/2014

**THIRD YEAR FIRST SEMESTER EXAMINATIONS FOR THE
DEGREE OF BACHELOR OF SCIENCE IN ENVIRONMENTAL
SCIENCES WITH INFORMATION TECHNOLOGY
(MAIN CAMPUS)**

NES 305: PRACTICAL ENVIRONMENTAL CHEMISTRY

Date: 8th April, 2014

Time: 8.30 – 10.45 a.m.

INSTRUCTIONS:

- Answer Question ONE and any other TWO questions.

NES 305: PRACTICAL ENVIRONMENTAL CHEMISTRY.

TIME: 2HRS

INSTRUCTIONS: Answer question **ONE** and any other **TWO** questions.

1. (a). Carbonic acid (H_2CO_3) dissolve by the following reaction



$$K_t = 10^{-6.35} = \frac{[HCO_3^-][H^+]}{[H_2CO_3]}$$

If the total dissolved solid is 100mg/L and the hydrogen ion concentration 10^{-7} . Determine the ratio of bicarbonate (HCO_3^-) to carbonic acid with and without activity correction (15mks)

- (b) Assume the following statistics for CFC - 12 (CF_2CL_2):

Atmospheric residence time	= 159 yr
1985 emission rate	= 0.44×10^{12} g/yr
1985 atmospheric concentration	= 0.40 ppb

Suppose the emission rate of CFC -12 is instantaneously reduced to 50 percent of its 1985 value and held constant thereafter:

- i. What would be the final, steady - state atmospheric concentration of CFC-12? (8mks)
 - ii. What cut in the emission rate would be required for CFC-12 concentrations to remain constant at the 1985 level of 0.40 ppb? (7mks)
2. Discuss the mechanism of photochemical smog formation. (10mks)
3. (a). Describe the mechanism involved in stratospheric ozone depletion by chlorofluorocarbon. (10mks)
- (b). Discuss the chemistry of acid rain. (10mks)

4. From the data of volumetric analysis given below,

Sample 100 ml	Total ml of titrant to reach end point	
	Phenolphthalein	Methyl orange
A	10	15.5
B	14.4	38.6
C	8.2	8.4
D	0	12.7

Calculate the

- i. Hydroxide Alkalinity, (7mks)
- ii. Carbonate Alkalinity (7mks)
- iii. Bicarbonate Alkalinity (6mks)

5. The total hardness value obtained from the complete analysis of a water sample is found to be 116mg/l. The analysis further shows that the concentrations of all the three principal cations causing hardness are numerically the same. If the value of C.H. is 58mg/l. calculate the following.

- a. The value of N.C.H.; (7mks)
- b. The concentrations of principal cations; and (8mks)
- c. The value of total alkalinity in mg/l. (5mks)

6. Describe the chemistry involved in the removal of Sulphur Dioxide from the atmosphere. (20mks)